obtained a value of 1·8 for 85 Pegasi, but *adopted* 1·0; and on p. 233 he also points out that in Sirius we have a system in which is an even greater disparity between mass and luminosity in the two components, and he adopts Boss's computed value. Incidentally, this weakens one of the facts of observation made use of in discussing the "origin of the binary stars." Future progress is dependent on departures from our preconceived ideas.

In chaps. x. and xi. the author is more happy in dealing with his material—a large percentage being his own contribution during the last twenty years—and we are given a number of most interesting tables and results. Here are a few:—(1) At least one in every eighteen stars, on the average, in the northern half of the sky, which are as bright as 9·0 B.D. magnitude, is a close double star visible with the 36-in. refractor. (2) The percentages of double stars by magnitude classes are:

Mag. to 6·5	percentage 11·1	7·6 to 8·0	percentage 6·8
6·6 „ 7·0	„ 7·9	8·1 „ 8·5	„ 5·3
7·1 „ 7·5	„ 7·2	8·6 „ 9·0	„ 4·1

(3) Visual doubles are relatively more numerous in the Milky Way than elsewhere in the sky. (4) Visual binaries as bright as 6·5 magnitude are in excess amongst class G stars, and least in K and M. (5) Visual and spectroscopic binaries of every spectral class increase in numbers as the Milky Way is approached. (6) Spectroscopic binaries as bright as 5·5 magnitude are far the most numerous amongst stars of spectral type B.

To these are added, in chap. xi., the following from points brought out in the previous chapters: (7) The considerable percentage of multiple systems. (8) Close correlation between period and ellipticity. (9) Period and spectral type. (10) Relative brightness and relative masses of the two components. (11) Relatively great mass of a binary compared with the sun. (12) Spectroscopic binaries of class B, on the average, are three times as massive as those of later types.

All these and other minor points are discussed in connection with their bearing on the "origin of the binary stars." Of the three theories: (1) Capture, (2) fission, (3) independent nuclei, the author, having no alternative theory of his own, favours (2). The book contains a mass of interesting data well discussed. The physicist as well as the astronomer will find it a real treasury. It must also appeal to the wider circle of our readers.

THE SCIENCE OF IRON-FOUNDING.

Cast Iron in the Light of Recent Research. By Dr. W. H. Hatfield. Second edition, revised and enlarged. Pp. xvii + 292. (London: Charles Griffin and Co., Ltd., 1918.) Price 12*s*. 6*d*. net.

THIS important work on the metallurgy of iron and steel has been enriched, in its second edition, to the extent of some forty-six pages of new matter, including thirty-nine fine reproductions of micro-structures. The chapter on "The Heat Treatment of Cast Iron" has been divided so that the annealing of grey cast iron is treated separately. The new matter includes Prof. Carpenter's valuable contribution on "The Effect of Working Temperatures on Parts of Internal-combustion Engines," the author's report to the Ministry of Munitions on "The Present Position of the Malleable Casting Industry in this Country"—an illogical but welcome inclusion—"The Influence of Sulphur in the Presence of Silicon" (chap. xv.), and "The Limits of Phosphorus in Malleable Castings" (chap. xvi.).

A careful perusal of this work suggests that not much research, recent or ancient, has escaped notice, and everything worthy of note on the theoretical or the quasi-practical side of cast iron is included within the covers of the book. The difficulty is to locate and isolate in a concise form any particular information required. The impression is created that the author has been more or less overwhelmed by the mass of data collected. This results in a sense of uncertainty and a tendency to confusion in the mind of the reader. The author, who is undoubtedly an expert in his subject, would be well advised in any future edition to set out clearly a summary of each chapter, even more fully than has been done in the two new chapters, which in this respect are fairly well equipped.

The portions dealing with heat treatment, especially that which treats of malleable cast iron, bear the true impress of authority, and when this idea is conveyed by the rest of the book it should become the standard work on the metallurgy of cast iron as distinct from iron-founding. All such works should bear the hall-mark of a convincing personality.

The technically trained practical man will find great help in fitting himself either to meet specifications or to account for failures. Graduates and others seeking promising fields of research will find them in plenty, whilst those who delight in public controversy, provided they have easy access to a scientific library (so that the all-too-numerous references may be turned up), will be in clover. In the hope that this book may become the standard classic, we suggest that careful attention should be paid to what may appear to be matters of detail. For example, several graphs do not show clearly the increments which constitute the co-ordinates, and analyses occasionally are far from complete.

It is to be regretted that the chapter on mechanical properties is included in its present form. This should be entirely re-written. Even the pressure of war-time duties does not excuse the use of such terms as "breaking strain in tons per square inch" and "compressive strain." Admitting that cast iron is almost devoid of ductility, "breaking load" is not the correct expression. Again, in dealing with the transverse test, too little attention is paid to the relative value of the maximum stress under the two recognised standard conditions, and there is no

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reference to any correction for slight variations in sectional area, whilst undue prominence is given to the maximum load on section calculated to tons per square inch, which form of report is of very doubtful use.

Dr. Hatfield is to be heartily congratulated on this work as a whole.

OUR BOOKSHELF.

A Modern Pilgrim in Mecca. By Major A. J. B. Wavell. New cheaper impression. With an introduction by Major Leonard Darwin. Pp. xv+232. (London: Constable and Co., Ltd., 1918.) Price 2*s.* 6*d.* net.

FEW Christians have been to Mecca, and fewer still to Medina, or, if they have attempted the journey, have survived to tell the tale. Here is the story of how a young man of twenty-six successfully accomplished the feat. Major Wavell, travelling in disguise *via* Beyrout and Damascus, reached Medina by the Hedjaz railway in 1908. After some weeks' stay in that city, where he had one or two narrow escapes from detection, he made his way by camel caravan to Yemba, on the coast, the overland route to Mecca being closed, owing to the rising of the Bedou tribes. From Yemba Major Wavell went by sea to Jiddah, and thence reached Mecca. His stay in Mecca seems to have been safer than in Medina, but not without risks. The pilgrimage to Mina was made before the return to Jiddah and the departure for Egypt. The book is full of information; many pages glow with colour, and not one lacks fascination. As the author says of himself, he was "never averse to being where anything interesting is taking place." That is the spirit in which he carried out this dangerous enterprise. His two companions were an Arab from Aleppo and a Mombasa Swahili. To avoid the chance of detection, he adopted the expedient of telling Arabs that his language was Swahili, and when he met natives of East Africa, of saying he was from Muscat and spoke only Arabic.

The book has an introduction on the geography of Arabia, with an account of Mohammedanism. Major Leonard Darwin contributes a short life of this daring soldier, whose brilliant career ended at the age of thirty-four, when he fell in action in East Africa at the head of the Arab corps which he had raised. The present edition is a cheap reprint; it has a map, but no illustrations. It is to be hoped that in the rising tide of war-books this fascinating volume will not be overlooked.

A Junior Course of Practical Zoology. By the late Prof. A. Milnes Marshall and the late Dr. C. Herbert Hurst. Eighth edition, revised by Prof. F. W. Gamble. Pp. xxxvi+515. (London: John Murray, 1918.) Price 12*s.* net.

IN the new edition of this well-known and excellent manual amœbæ from the soil are recommended for study as a substitute for the larger species *Amoeba proteus*, when this is not available, and two types not hitherto included—the large trypanosome of the dogfish and a tapeworm—are described. Careful directions are given for preparing a culture of the soil amœbæ and for obtaining trypanosomes by centrifuging the blood of the dogfish, the trypanosomes present being carried down with the blood corpuscles to the bottom of the tube, whence they can be withdrawn with a pipette for examination in a drop of the plasma.

In the account of the encystation of Amœba reference is made to the reproductive cysts from which issue "in one marine species at least . . . minute flagellated spores which conjugate in pairs and form amœbulæ." This statement relates, however, to a species of Paramœba, and as the account is headed "*Amoeba proteus*" it would have been better to refer to Miss Carter's observations on the reproductive cyst of this species from which amœbulæ were found to issue.

The kinetonuclear end of the trypanosome is regarded as anterior—a view which is not usually held. Although trypanosomes often move with this end in front when among a mass of corpuscles, the flagellum is usually anterior when free movement is possible.

There is a slip on p. 16, where it is stated that the zygote of Monocystis "divides four times, producing eight sporozoites"—there are, of course, only three successive divisions—and the statement on p. 33 that some of the buds of Obelia "have no mouth and become medusæ" is loose.

In the section of the work on vertebrates the principal change is the insertion in the text describing the rabbit's skull of a figure of the dorsal, and another of the ventral, aspect of the dog's skull.

How to Deal with Different Kinds of Fires. Some Hints by Sidney G. Gamble. Pp. 50. (London: The British Fire Prevention Committee, 1918.) Price 3*s.* 6*d.*

THE type of man generally placed in charge of works and property cannot be expected to have either the necessary experience or knowledge to enable him to direct advantageously or deal efficiently with an outbreak of fire, especially if the materials are not the ordinary combustibles, but chemicals, forage, coal, and the like. To assist these men and others the British Fire Prevention Committee has issued this Red Book, which is No. 201 of the committee's publications. Mr. Gamble, who until 1918 was second officer of the London Fire Brigade, gives in the first part of the book general information, and the effect of water, steam, chemicals, and so on, applied from different forms of fire appliances. The second part of the book deals alphabetically with numerous materials and kinds of fire in turn. Useful scientific data have been added, while an appendix on spontaneous combustion and a list of enactments bearing on the fire question complete a very useful compilation.

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